NORIT Americas, Inc.

Pre-Modeling Protocol for Prevention of Significant Deterioration Supplemental Air Dispersion Modeling

Pryor Facility
Pryor, Oklahoma

August 2010

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SECTION 1
PROJECT OVERVIEW

NORIT Americas, Inc. (NORIT) owns and operates a facility in Pryor, Oklahoma, further referenced in this document as the Pryor Facility. The Pryor Facility manufactures activated carbon using coal as a raw material. In 1988 and 1989, the facility installed a new primary carbonizer, which resulted in increases in emissions of nitrogen oxides (NO_X), sulfur dioxide (SO_2) and particulate matter less than 10 microns in diameter (PM_{10}).

NORIT was required to complete a retroactive Prevention of Significant Deterioration (PSD) permit application and associated air dispersion modeling. PSD modeling for Nitrogen Dioxide (NO_2) annual; SO_2 3-hour, 24-hour, and annual; and PM_{10} 24-hour and annual averaging periods was completed in 2008. Class I Impact Analyses were initiated in 2009 and completed in early 2010. Both analyses demonstrated compliance with all applicable regulations.

Since that time, there have been numerous changes in EPA requirements for PSD air quality analyses. These changes include updated $PM_{2.5}$ modeling guidances[1,2] issued on February 26 and March 23, 2010, a new 1-hr NO_2 National Ambient Quality Standard (NAAQS)[3] that became effective on April 12, 2010, a new 1-hr SO_2 NAAQS[4] that will become effective on August 23, 2010, and 1-hour NO_2 modeling guidelines[5] released on June 29, 2010. As a result, NORIT was additionally requested to address compliance with the referenced standards.

NORIT contracted with Sage Environmental Consulting, L.P. (Sage) to prepare the modeling protocol, conduct modeling, and to prepare the modeling report for the Pryor Facility. The purpose of this pre-modeling protocol is to demonstrate that the PSD modeling will be conducted in accordance with the new requirements and previously published U.S. EPA and Oklahoma modeling guidelines and manuals[6,7]. This modeling protocol includes documentation of the proposed PSD air dispersion analyses approach.

[1] U.S. EPA, *Review of Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS*. EPA's SCRAM Web page
[2] U.S. EPA, *Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS*. Memorandum, March 23, 2010
[3] U.S. EPA, *Primary National Ambient Air Quality Standards for NO_2*. Federal Register V. 75 N. 26, February 9, 2010
[4] U.S. EPA, *Primary National Ambient Air Quality Standard for SO_2*. Federal Register V. 75 N. 119, June 22, 2010
[5] U.S. EPA, *Guidance Concerning Implementation of the 1-hour NO2 NAAQS for the Prevention of Significant Deterioration Program*, Memorandum, EPA's New Source Review Policy & Guidance Web page, June 29, 2010.
[6] U.S. EPA, *Draft New Source Review Workshop Manual. Prevention of Significant Deterioration and Nonattainment Area Permitting*, U.S. EPA, Office of Air Quality, October 1990.
[7] Oklahoma Department of Environmental Quality, *Air Dispersion Modeling Guidelines for Oklahoma Air Quality Permits.* December 2006.

SECTION 2
NEW STANDARDS AND GENERAL MODELING APPROACH

EPA guidance for performing PSD air quality analyses is set forth in Chapter C of U.S. EPA's *New Source Review Workshop Manual*, Draft - October 1990, and in U.S. EPA's *Guideline on Air Quality Models*, 40 CFR Part 51 Appendix W (further referred to as the GAQM). A PSD modeling analysis is typically conducted in two steps: a "project-only" significant impact analysis and, if required, a cumulative impact analysis for all on-site and applicable off-site sources.

2.1 General PSD Modeling Requirements

The following subsections describe the general approach discussed in U.S. EPA's *New Source Review Workshop Manual*, Draft - October 1990.

2.1.1 Significant Impact Analyses

Significant impact analyses estimate the ambient impacts from the proposed project alone (and contemporaneous emissions increases and decreases, if applicable), for those pollutants with net actual emission increases above the significant emission levels. The results of the significant impact analysis determine whether a cumulative impact analysis (including emissions from other nearby sources) must be performed. If the ambient impacts from the proposed project are less than the significant impact levels (SIL) for a particular pollutant and averaging period, then no additional modeling needs to be performed to meet NSR permitting requirements.

2.1.2 Cumulative Impact Analyses

Cumulative impact analyses are performed to assess compliance with Class II NAAQS and the PSD Increments for any pollutant/averaging period for which the project results in significant impacts.

2.2 Model Design Concentrations

Section 7.2 of the GAQM defines the dispersion model outputs or "design concentrations" that are used to assess compliance with the NAAQS and PSD increments. EPA recommends in GAQM Section 8.3.1.2 that the air quality modeling analyses should be based on either five years of National Weather Service data or at least 1 year of site specific data. No site-specific meteorological data is available for the Pryor Facility; however, five years of meteorological data for Eastern Oklahoma processed by Oklahoma DEQ are available for modeling. Therefore, the model design concentrations are based on GAQM Section 7.2 recommendations, as described below.

For the $PM_{2.5}$ significant impact analysis, the modeled concentrations that are to be compared to the proposed $PM_{2.5}$ SILs are the highest 5-year average of the maximum 24-hr concentrations (averaged on a receptor-by-receptor basis) and the highest 5-year average of the annual concentrations (averaged on a receptor-by-receptor basis). For the 1-hr NO_2 significant impact analyses, the 1-hr modeled concentrations that are to be compared to the interim SIL are the highest 5-year average of the 1-hr concentrations (averaged on a receptor-by-receptor basis). No SIL has yet been established for 1-hr SO_2 significant impact analyses.

The following design concentrations have been established for Full Impact modeling:

- The 1-hr SO_2 NAAQS design concentration is the highest 99th percentile of the annual distribution of daily maximum 1-hour concentrations, averaged on a receptor-by-receptor basis across the number of years modeled;

- The 1-hr NO_2 NAAQS design concentration is the highest 98th percentile of the annual distribution of daily maximum 1-hour concentrations, averaged on a receptor-by-receptor basis across the number of years modeled; and

- For $PM_{2.5}$, the 24-hr and annual design concentrations are to be based on the latest EPA guidance memorandum *Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS*, EPA OAQPS, March 23, 2010. For the 24-hr NAAQS design concentration, the highest 24-hr $PM_{2.5}$ concentration is to be determined for each of the 5 years modeled for each receptor, these values are to be averaged on a receptor-by-receptor basis, and the highest of these averages is to be selected as the design concentration. For the annual average, the highest annual $PM_{2.5}$ concentration is to be determined for each year modeled at each receptor, these five values are be averaged on a receptor-by-receptor basis, and the highest average is selected as the annual design concentration.

Table 1 presents the SILs, as well as the PSD increments, the NAAQS, and the Significant Monitoring Concentrations (SMCs) for the pollutants of concern.

Table 2-1 Selected Pollutant SILs, SMCs, Standards, and Increments

Pollutant	Averaging Period	Class II SIL ($\mu g/m^3$)	Significant Monitoring Concentrations ($\mu g/m^3$)	National Ambient Standards (NAAQS) ($\mu g/m^3$)	Class II PSD Increment ($\mu g/m^3$)
NO_2	1-Hour	2.0-7.5	--	188	--
SO_2	1-Hour	--	--	196	--
$PM_{2.5}$	24-Hour	1.2-5.0	--	35	--
	Annual	0.3-1.0	--	15	--

Note: There is no Significant Monitoring Concentration or Class II PSD Increment established for either of the three pollutants and averaging period combinations. A Significant Impact Level has not been established for SO_2, and only interim SILs were proposed for NO_2 and $PM_{2.5}$.

2.3 Proposed Modeling Approach for Individual Pollutants

No site-specific meteorological data is available for the Pryor Facility; however, five years of meteorological data for Eastern Oklahoma processed by Oklahoma DEQ are available for modeling. The modeling will be therefore based on five years of meteorological data as further discussed in Section 10.

The following Subsections 2.3.1 through 2.3.3 discuss a general modeling approach for each pollutant of concern. ODEQ agreement to use the proposed approach is requested for each pollutant.

2.3.1 NO_2 1-hour Average Modeling

The interim SIL established for NO_2 by ODEQ is 2.0 µg/m^3,[8] and the interim SIL proposed by the U.S. EPA is 4 ppb (approximately 7.5 µg/m^3). Based on the 2008 modeling analyses, Sage proposes to avoid (skip) Significant Impact Analysis for NO_2 1-hour Average Modeling and conduct a six-step NAAQS modeling as follows.

Step 1. In the first step, all on-site Pryor Facility sources will be modeled at their respective maximum allowable emission rate (see a discussion regarding the NO_2 emission rate for the Primary Carbonizer in Section 6). The modeling will be conducted on a receptor grid covering a 20-km Area of Significant Impact (consistent with the prior Class II modeling analyses) or a 50-km Area of Significant Impact consistent with ODEQ request, as further discussed in Section 9, using five years of meteorological data. Tier 2 (Ambient Ratio Method) modeling methodology discussed in greater detail in Section 11.1 will be predicted. In this step, the highest model-predicted value will be added to the monitoring design value of 43 µg/m^3 provided by the ODEQ in March 30, 2010 modeling request letter. If the resulting value is less than 90% of the 1-hour NAAQS, the demonstration will be assumed complete; otherwise, the modeler will proceed to the next step.

Step 2. The second step will serve to refine the first step results by eliminating double-counting of the impacts from the Pryor Facility sources in the monitoring design value. In this step, the monitoring design value will be adjusted consistent with the discussion for background concentrations provided in Section 6.4. A highest cumulative impact of all on-site Pryor Facility sources operating at their respective maximum allowable emission rate will be modeled for the location of the U.S. EPA monitoring station located at Cherokee Heights Drive in Mayes County, OK (Station EPA ID: 400979014). The modeled concentration will be subtracted from the monitoring design value of 43 µg/m^3 provided by the ODEQ and the result will be totaled with the highest model-predicted value for the Pryor sources discussed above. If the resulting value is less than 90% of the 1-hour NAAQS, the demonstration will be assumed complete; otherwise, the modeler will proceed to the next step.

[8] Oklahoma Department of Environmental Quality, Letter request to prepare additional PSD Class II NO_2 and PM_{10} modeling analyses. March 30, 2010.

Step 3. In the third step, off-site NO_2 sources will be added to the modeling. A Point Source Database (PSDB) retrieval for all significant off-site NO_2 sources within 70 kilometers (km) from the Pryor Facility was provided to NORIT in 2008 for the annual NO_2 modeling. The PSDB provided maximum hourly emission rates for all sources. The modeler requests to use the 2008 PSDB data in Step 3 modeling without changes. A copy of the 2008 PSDB may be provided to ODEQ for approval.

Tier 2 modeling methodology will be used in the third step modeling. If the highest predicted concentration averaged over the 5-year period plus the background concentration from Step 2 modeling is less than the NAAQS for all receptors, the demonstration will be assumed complete; otherwise, the modeler will proceed to the next step.

Step 4. The fourth step will serve to refine the third step results by eliminating double-counting of the impacts from the Pryor Facility and all significant off-site sources in the monitoring design value. In this step, the monitoring design value will be further adjusted consistent with the discussion for background concentrations provided in Section 6.4. A highest cumulative impact of all sources included in the third step will be modeled for the location of the Cherokee Heights Drive monitoring station. The modeled concentration will be subtracted from the monitoring design value of 43 $\mu g/m^3$ provided by the ODEQ and the result will be totaled with the highest model-predicted value for the sources in the third step modeling. If the resulting value is less than the NAAQS, the demonstration will be assumed complete; otherwise, the modeler will proceed to the next step.

Step 5. In the fifth step, the 98th percentile of the annual distribution of daily maximum 1-hour concentrations, averaged on a receptor-by-receptor basis across the number of years modeled, will be calculated. All sources discussed in the third step modeling above will be included. However, the receptor grid will be reduced to only include the receptors for which the fourth step modeling predicts potential exceedances of the NAAQS. Since replacing the highest predicted concentrations with 98th percentile concentrations may only reduce the predicted impacts, we believe that this request regarding a reduction in the number of the modeled receptors is reasonable. Please note that POSTFILEs required to estimate the 98th percentile values may be very large. In a recent modeling, the size of each POSTFILE for a receptor grid containing less than 450 receptors exceeded 1.3 Gigabytes (Gab) for each modeled year. The request to reduce the number of the modeled receptors is thus additionally justified to avoid the creation of unmanageable file sizes. If the resulting value is less than the NAAQS, the demonstration will be assumed complete; otherwise, the modeler will proceed to the next step.

Step 6. In the sixth step, the modeler will demonstrate that in cases where modeled violations of the 1-hour NAAQS are predicted, but additional model runs for all on-site sources as a single Source Group and for all off-site sources as a separate Source Group show that the NO_2 emissions from the Pryor Facility will not have a significant impact at the point and time of any modeled violation, the Pryor Facility will not cause or contribute to the violation. This approach is consistent with the general U.S. EPA PSD modeling guidelines and the June 28, 2010 NO_2 modeling memorandum.

If the modeling does not pass the previously discussed six steps, additional modeling may be conducted to evaluate increases in the stack height of the Pryor Facility sources or other creditable measures that allow the facility to avoid NAAQS violations.

2.3.2 SO_2 1-hour Average Modeling

The interim SIL proposed for SO_2 by ODEQ is 3 ppbv (approximately 7.9 µg/m^3)[9]. Based on the 2008 modeling analyses, Sage proposes to avoid (skip) Significant Impact Analysis for SO_2 1-hour Average Modeling and conduct a six-step NAAQS modeling demonstration instead. The proposed six steps are essentially the same as discussed above for NO_2 1-hour modeling, with the following modifications:

- In the first four steps, the modeling will be conducted on a receptor grid covering a 50-km Area of Significant Impact. The 50-km Radius of Impact (ROI) is consistent with the prior Class II modeling analyses.

- No adjustments to the SO_2 emission rates or model predictions (e.g., SO_2 half-decay period adjustments) will be utilized unless explicitly authorized by ODEQ.

- The monitoring design value of 151.9 µg/m^3 provided by the ODEQ in the July 19, 2010 letter will be used in the first step modeling and second through fourth step modeling adjustments, as necessary. However, in the fifth and sixth steps, the modeler will use either the average highest first-high SO_2 1-hour concentrations actually monitored at the Cherokee Heights Drive in Mayes County, OK (Station EPA ID: 400979014) and averaged over a three or five year period or the 99th percentile of the actually monitored values averaged over a three or five year period at this station. See additional discussion in Section 6.4.

- A Point Source Database (PSDB) retrieval for all significant off-site SO_2 sources within 100 kilometers (km) from the Pryor Facility including sources in Oklahoma, Kansas, Missouri, and Arkansas were obtained in 2008 for the 3-hour and 24-hour SO_2 modeling. The PSDBs provided maximum hourly emission rates for all sources. The modeler requests to use the 2008 PSDB data in the third and following modeling steps without changes. Copies of the 2008 retrievals may be provided to ODEQ for a review.

- The 99th percentile of the annual distribution of daily maximum 1-hour concentrations, averaged on a receptor-by-receptor basis across the number of years modeled will be used in the fifth and following steps.

[9] Oklahoma Department of Environmental Quality, Letter request to prepare additional PSD Class II SO_2 modeling analyses. July 19, 2010.

2.3.3 $PM_{2.5}$ 24-hour and Annual Average Modeling

Issues related to implementing the NSR program for $PM_{2.5}$ were addressed in a memorandum dated March 23, 2009, *Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS*. The main issue was related to use of the "surrogate policy." In the memorandum EPA stated that states "may still rely upon the PM_{10} surrogate policy as long as (1) the appropriateness of the PM_{10}-based assessment for determining $PM_{2.5}$ compliance has been adequately demonstrated based on the specifics of the project; and (2) the applicant can show that a $PM_{2.5}$ analysis is not technically feasible."

The NAAQS Full Impact Modeling (FIM) conducted in 2008 included Source Group: ONSITE, which estimated the Highest 1st-High, 2nd-High, and 6th-High 24-hour average cumulative concentrations and the highest annual average cumulative concentrations for all Pryor Facility sources for each of the five modeled years. The Highest 1st-High (H1H) 24-hour concentrations for each of the five modeled years and the highest annual predicted concentrations for the five years were processed to calculate the values averaged over the 5-year modeled period consistent with the design concentrations for $PM_{2.5}$ discussed in Section 2.2 above. Additional adjustments to the predicted PM_{10} values were made to reasonably estimate $PM_{2.5}$ concentrations. The 2008 modeling results for PM_{10} and $PM_{2.5}$ concentrations estimated based on the discussion below are presented in the Table 2-2.

Table 2-2 Summary of 2008 FIM PM_{10} and Estimated $PM_{2.5}$ 24-hour and Annual Results

Pollutant	Averaging Period	Ranking	Highest Average 5-year Prediction ($\mu g/m^3$)	Average Weighted $PM_{2.5}/PM_{10}$ Ratio Based on the Stack Test	Estimated Highest $PM_{2.5}$ 5-year Average Concentration ($\mu g/m^3$)
PM_{10}	24-Hour	H1H	35.55	14.02%	4.98
PM_{10}	Annual	Highest	4.51	14.02%	0.63

The Highest $PM_{2.5}$ 5-year Average Concentrations in Table 2-2 were estimated as follows. First, the average H1H 24-hour average and highest annual average concentrations were determined from the 2008 FIM modeling for Source Group: ONSITE on receptor-by-receptor basis. In May 2009 NORIT conducted particulate matter stack tests on major stacks at the Pryor Facility. The May 2009 stack tests contained 11 cumulative particle size analysis profiles for two emission sources. The test results were submitted to ODEQ in June 2009. The cumulative $PM_{2.5}$ volume percent ranged from 0.82% to 14.02%. For a conservative estimate, the weight percent numerically equal to the highest volume percent measured during the tests is presented in Table 2-2. The values in the rightmost column in Table 2-2 are the result of multiplication of the two values discussed above.

When the estimated $PM_{2.5}$ concentrations are added to the 3-year average 98th-percentile 24-hour value of 26.30 $\mu g/m^3$ monitored at the Cherokee Heights Drive in Mayes County, OK, the resulting 31.3 $\mu g/m^3$ concentration of $PM_{2.5}$ is less than 90% of the 24-hour

standard. When the estimated concentrations are added to the 3-year average annual value of 11.63 µg/m^3 monitored at the same monitoring station, the resulting 12.26 µg/m^3 concentration of $PM_{2.5}$ is less than 82% of the annual standard.

A consolidated modeling of $PM_{2.5}$ emissions for the Pryor sources and nearby off-site sources is not considered technically feasible. Based on the 2008 FIM, combined H1H PM_{10} 24-hour average impact from the Pryor sources, in absolute values (i.e., disregarding the location of the highest concentration for Source Groups: ONSITE and OFFSITE), was less than 27% of the H1H impacts created by off-site sources at any receptor. The Oklahoma PSDB does not contain average daily $PM_{2.5}$ emission rates for the off-site sources. Without $PM_{2.5}$ emission rates for the off-site sources, modeling is not going to produce meaningful results.

Taking into account that the monitored $PM_{2.5}$ concentrations in Mayes County have never exceeded the NAAQS, we believe that both conditions allowing facilities to continue applying the "surrogate policy" through the regulatory deadline until May 2011, or until U.S. EPA approves the revised Oklahoma SIP for $PM_{2.5}$, whichever comes first. Therefore, the demonstration of compliance with the $PM_{2.5}$ NAAQS under the provisions of the "surrogate policy" is considered complete, subject to ODEQ approval. $PM_{2.5}$ modeling is not addressed any further in this protocol.

SECTION 3
IMPACT ASSESSMENT TOOLS

The latest code (version 09292) of the U.S. EPA approved AERMOD model will be used to predict maximum ground-level off-property concentrations of modeled pollutants. A commercial version of the model (BEEST for Windows by Bee-Line Software, Version 9.83, released in July 2010) will be used as the modeling interface. In this analysis, modeling with AERMOD will be performed using the regulatory default options, which includes stack heights adjusted for stack-tip downwash, buoyancy-induced dispersion, and final plume rise. Ground-level concentrations occurring during "calm" wind conditions will be calculated by the model using the calm processing feature. Regulatory default values for wind profile exponents and vertical potential temperature gradients will be used since no representative on-site meteorological data are available. Per U.S. EPA requirements, direction-specific building dimensions will be used for both the Schulman-Scire and the Huber-Snyder downwash algorithms.

Implementation of the new standards revises and expands the previously-approved modeling procedures to address these new air quality analysis requirements. EPA's guidance on PSD implementation of the 1-hr NO_2 NAAQS[10] notes that many sources have reported difficulties in modeling compliance with the new NAAQS. Therefore, EPA's additional guidance[11] provides recommended procedures and approaches that can help address these potential modeled exceedances. This three-tiered approach for NO_2 and the option proposed for this specific modeling is discussed in Section 11.1.

As discussed in Section 2, the new NO_2 and SO_2 standards are probabilistic, which requires post-processing of initial modeling results to demonstrate compliance with the standards. BEEST for Windows software includes post-processors to calculate the required statistical probabilities of NO_2 and SO_2 concentrations as prescribed in the U.S. EPA's notice[12]. More details regarding the proposed post-processing procedures are provided in Section 11.2.

[10] U.S. EPA, *General Guidance on Implementing the 1-hour NAAQS in PSD Permits*, Memorandum, EPA's Office of Air Quality Planning and Standards, June 28, 2010.
[11] U.S. EPA, *Applicability of Appendix W Modeling Guidance for the 1-hour NO_2NAAQS*, Memorandum, EPA's Office of Air Quality Planning and Standards, June 28, 2010.
[12] U.S. EPA, *Notice Regarding Modeling for New Hourly NO2 NAAQS.* February 25, 2010 (Updated).

SECTION 4
PLOT PLAN

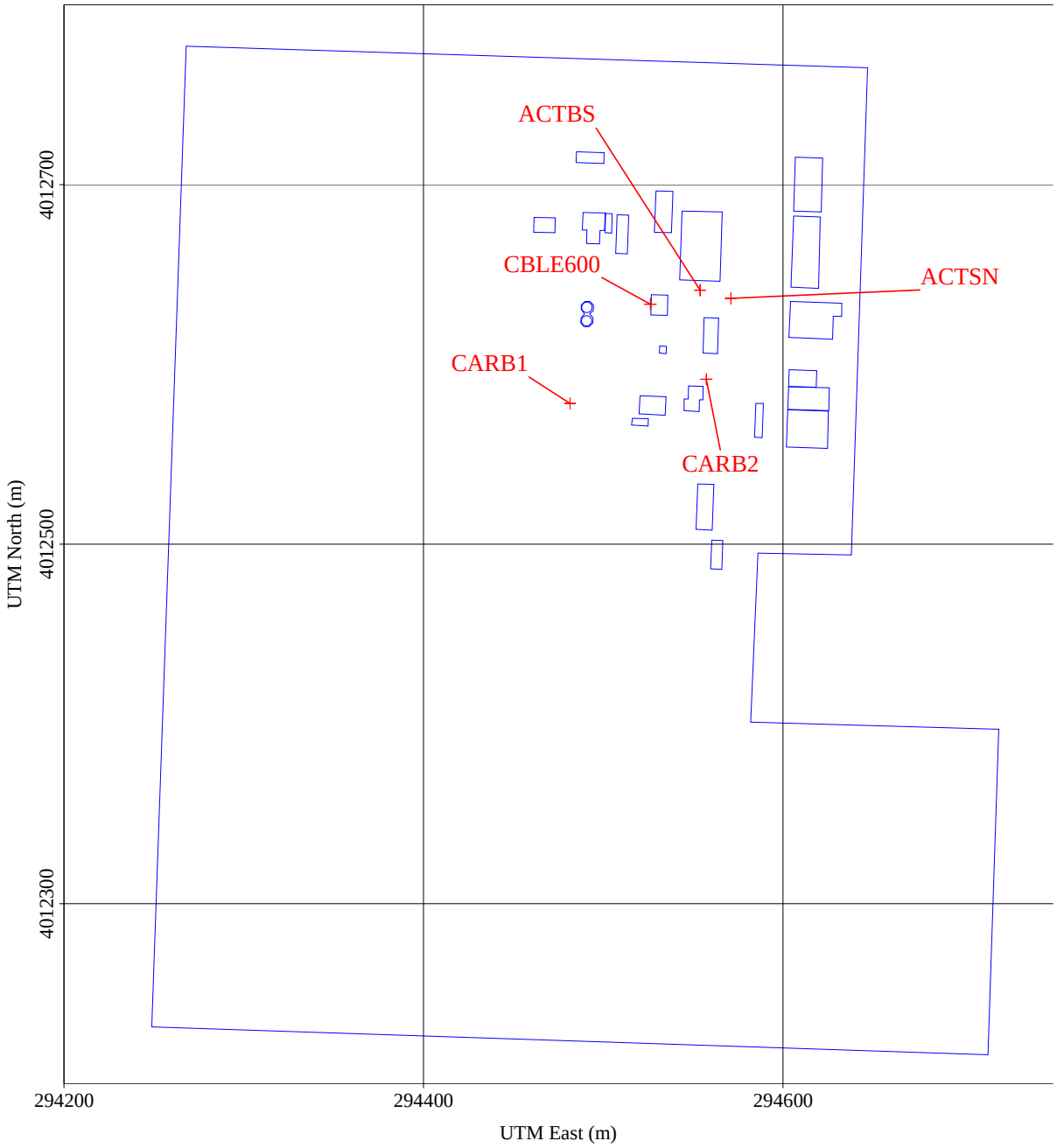
The equipment affected by this project is located at the existing Pryor Facility near Pryor, Oklahoma. The locations of the emission sources relative to the facility property are shown in Figure 4-1.

Figure 4-1 contains the UTM coordinates grid overlaying the property and is included to provide a generalized image of the facility layout. Figure 4-2 provides a detailed plot plan of the facility. In all modeling analysis input and output data files, the location of emission sources, structures, and receptors will be represented in the Universal Transverse Mercator (UTM) coordinate system. All UTM coordinates used in the modeling will be based on the North American Datum (NAD) 83. Figure 4-1 shows location and ID of each emission source relative to the NAD 83.

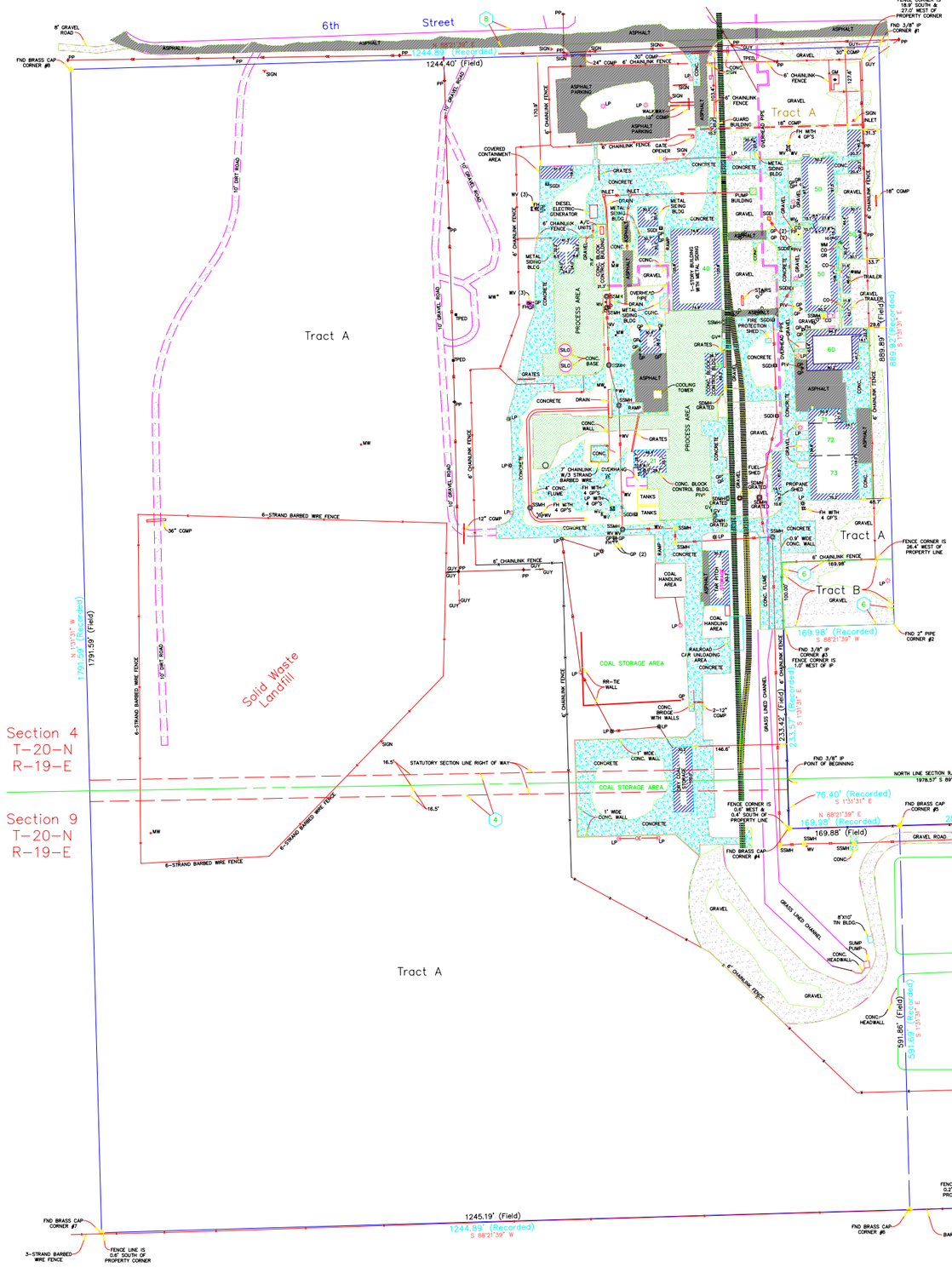
All emission units, buildings, structures, and property boundary locations were digitized from plot plans and/or measured on-site by NORIT personnel using advanced Global Positioning System (GPS) devices during the preparation to 2007-2008 PSD modeling. The measured values were converted to equivalent UTM coordinates. The 2008 modeling files will be used in the proposed modeling.

The position of all model objects will be additionally verified by overlaying the objects on an aerial photo downloaded from Google Earth or an equivalent source and imported in BEEST for Windows setup screen. If significant discrepancies are revealed, the aerial photo image will be considered more accurate source of information and position of each applicable modeled object will be corrected accordingly. The Pryor Facility's rectangular, polygonal, and circular buildings and structures and their corresponding UTM coordinates will be presented in tables included in the Appendices of the modeling report.

Figure 4-1 Generalized Facility Plot Plan



Note: The property line and significant downwash structures are shown in blue color. The NO_2 and SO_2 sources are shown in red color.



Notes

1. THE PROPERTY DESCRIBED HEREON IS SUBJECT TO THE TERMS, CONDITIONS AND PROVISIONS OF ORDINANCE NO. 91-1, EXECUTED BY THE JOINT AIRPORT ZONING BOARD OF THE MID-AMERICA INDUSTRIAL AIRPORT, DATED APRIL 4, 1991, FILED APRIL 22, 1991, RECORDED IN BOOK 726, PAGE 724.
2. THE PROPERTY DESCRIBED HEREON MAY OR MAY NOT BE AFFECTED BY THE JOINT ROAD USE PERMIT WITHIN QUITCLAIM DEED TO GRAND RIVER DAM AUTHORITY, DATED OCTOBER 19, 1948, FILED MAY 19, 1949, RECORDED IN BOOK 253, PAGE 180. EASEMENT NO. 1 THROUGH EASEMENT NO. 12 WITHIN SAID QUITCLAIM DEED DO NOT AFFECT THE PROPERTY DESCRIBED HEREON.
3. THE PROPERTY DESCRIBED HEREON IS SUBJECT TO THE TERMS, CONDITIONS AND PROVISIONS OF AGREEMENT BETWEEN THE OKLAHOMA ORDNANCE WORKS AUTHORITY AND THE MISSOURI-KANSAS-TEXAS RAILROAD COMPANY, DATED SEPTEMBER 29, 1961, FILED OCTOBER 18, 1961, RECORDED IN BOOK 326, PAGE 151, AS PARTIALLY RELEASED BY PARTIAL RELEASE, CANCELLATION AND REVOCATION OF SAID AGREEMENT, DATED SEPTEMBER 29, 1961, FILED AUGUST 22, 1967, RECORDED IN BOOK 377, PAGE 308.
4. 16.5 FOOT WIDE STATUTORY SECTION LINE RIGHT OF WAY EASEMENT AS RESERVED BY ACT OF CONGRESS ON JULY 1, 1902 WITHIN THE CHEROKEE NATION.
5. EASEMENTS FOR ELECTRICAL LINES, POLES, WIRES, STRUCTURES AND FIXTURES TOGETHER WITH THE RIGHT OF INGRESS AND/OR EGRESS OVER ROADS, STREETS AND LANDS OF THE SELLER CONTAINED WITHIN GRANT FROM THE OKLAHOMA ORDNANCE WORKS AUTHORITY TO THE GRAND RIVER DAM AUTHORITY, DATED FEBRUARY 11, 1966, FILED FEBRUARY 23, 1966, RECORDED IN BOOK 364, PAGE 47. WE ARE UNABLE TO DETERMINE THE LOCATION OF SAID EASEMENTS AND RIGHTS OF INGRESS AND/OR EGRESS. THEY THEREFORE MAY OR MAY NOT AFFECT THE PROPERTY DESCRIBED HEREON.
6. TRACT OF LAND REMOVED FROM THE MASTER LEASE AND AGREEMENT BY LETTER OR REQUEST, DATED MAY 5, 1978 FROM THE CARBORUNDUM COMPANY TO THE OKLAHOMA ORDNANCE WORKS AUTHORITY; SAID TRACT OF LAND SUBSEQUENTLY CONVEYED BY WARRANTY DEED TO THE CARBORUNDUM COMPANY, DATED MAY 18, 1978, FILED JUNE 12, 1978, RECORDED IN BOOK 558, PAGE 516.
7. THE PROPERTY DESCRIBED HEREON IS SUBJECT TO THE TERMS, CONDITIONS AND RESTRICTIONS AS CONTAINED IN CONSENT OF THE OKLAHOMA ORDNANCE WORKS AUTHORITY, DATED MAY 18, 1978, FILED JUNE 12, 1978, RECORDED IN BOOK 558, PAGE 511.
8. THE PROPERTY DESCRIBED HEREON IS BENEFITED BY PERMIT ISSUED BY THE OKLAHOMA ORDNANCE WORKS AUTHORITY, DATED MAY 18, 1978, FILED AUGUST 8, 1978, RECORDED IN BOOK 560, PAGE 469.
9. TRACT B IS SUBJECT TO THE TERMS, CONDITIONS AND RESTRICTIONS CONTAINED IN WARRANTY DEED, DATED MAY 18, 1978, FILED JUNE 12, 1978, RECORDED IN BOOK 558, PAGE 516.
10. THE PROPERTY DESCRIBED HEREON IS SUBJECT TO THE TERMS, CONDITIONS AND RESTRICTIONS CONTAINED IN WARRANTY DEED, FILED JUNE 12, 1978, RECORDED IN BOOK 558, PAGE 520.
11. THE PROPERTY DESCRIBED HEREON IS SUBJECT TO THE TERMS, CONDITIONS AND RESTRICTIONS CONTAINED IN WARRANTY DEED, DATED APRIL 16, 1991, FILED AUGUST 22, 1991, RECORDED IN BOOK 731, PAGE 801.
12. ALL OF THE PROPERTY DESCRIBED HEREON THAT IS WITHIN SECTION 4 IS SUBJECT TO RESTRICTIONS FOR USE CONTAINED WITHIN WARRANTY DEEDS RECORDED IN: BOOK 604, PAGE 251; BOOK 682, PAGE 821; BOOK 699, PAGE 392; BOOK 708, PAGE 664; BOOK 738, PAGE 513; BOOK 767, PAGE 357; BOOK 777, PAGE 325; BOOK 777, PAGE 445; BOOK 790, PAGE 59; BOOK 792, PAGE 188; BOOK 794, PAGE 969; BOOK 797, PAGE 102; AND BOOK 801, PAGE 848.

Miscellaneous Notes

A. ALL UNDERGROUND UTILITIES MAY NOT BE SHOWN HEREON. CALL "OKIE" BEFORE DIGGING.

B. THE BEARING BASE FOR THIS SURVEY IS ASSUMED BEARINGS.

C. ALL EASEMENTS AND RIGHTS OF WAY CONTAINED IN FIRST AMERICAN TITLE INSURANCE COMPANY COMMITMENT FOR TITLE INSURANCE, ELF ATOCHEM COMMITMENT, EFFECTIVE DATE: OCTOBER 15, 1995 AT 7:30 A. M., ARE SHOWN OR NOTED HEREON.

Legal Description Tract A

ALL THAT PARCEL OF LAND LOCATED IN SECTIONS FOUR (4) AND NINE (9), TOWNSHIP TWENTY (20) NORTH, RANGE NINETEEN (19) EAST OF THE INDIAN BASE AND MERIDIAN, IN MAYES COUNTY, STATE OF OKLAHOMA, MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT THE NORTHEAST CORNER OF SAID SECTION NINE (9), AT WHICH IS SET A 3/4" REBAR; THENCE S 89°00'56" W ALONG THE NORTHERLY BOUNDARY LINE OF SAID SECTION 9 A DISTANCE OF 1978.57 FEET TO THE POINT AND PLACE OF BEGINNING, AT WHICH IS SET A 1/2" REBAR; THENCE S 01°31' 31" E A DISTANCE OF 76.40 FEET TO A POINT; THENCE N 88°21'39" E A DISTANCE OF 169.98 FEET TO A POINT; THENCE S 01°31'31" E A DISTANCE 591.69 FEET TO A POINT; THENCE S 88° 21'39" W A DISTANCE OF 1244.89 FEET TO A POINT; THENCE N 01°31'31" W A DISTANCE OF 1791.59 FEET TO A POINT; THENCE N 88°21'39" E A DISTANCE OF 1244.89 FEET TO A POINT; THENCE S 01°31'31" E A DISTANCE OF 889.92 FEET TO A POINT; THENCE S 88°21'39" W A DISTANCE OF 169.98 FEET TO A POINT; THENCE S 01°31'31" E A DISTANCE OF 233.57 FEET TO THE POINT AND PLACE OF BEGINNING.

LESS AND EXCEPT

ALL THAT REAL PROPERTY SITUATED IN SECTION FOUR (4), TOWNSHIP TWENTY (20) NORTH, RANGE NINETEEN (19) EAST OF THE INDIAN BASE AND MERIDIAN, MAYES COUNTY, OKLAHOMA, DESCRIBED AS FOLLOWS: COMMENCING AT A 3/4" REBAR MARKING THE SOUTHEAST CORNER OF SECTION 4; THENCE ALONG THE SOUTHERLY LINE OF SAID SECTION 4, S 89°00'56" W 1978.57 FEET; THENCE N 01°31'31" W 233.57 FEET TO A BRASS CAP MONUMENT STAMPED CORNER #3, BEING THE TRUE POINT OF BEGINNING OF THIS DESCRIPTION; THENCE N 01°31'31" W 100.00 FEET; THENCE N 88°21'39" E 169.98 FEET TO A POINT WHICH BEARS N 01°31'31" W FROM CORNER #2, A BRASS CAP MONUMENT; THENCE S 01°31'31" E 100.00 FEET TO SAID CORNER #2; THENCE S 88°21'39" W 169.98 FEET TO THE TRUE POINT OF BEGINNING.

Legal Description Tract B

ALL THAT REAL PROPERTY SITUATED IN SECTION FOUR (4), TOWNSHIP TWENTY (20)NORTH , RANGE NINETEEN (19) EAST OF THE INDIAN BASE AND MERIDIAN, MAYES COUNTY, OKLAHOMA, DESCRIBED AS FOLLOWS: COMMENCING AT A 3/4" REBAR MARKING THE SOUTHEAST CORNER OF SECTION 4; THENCE, ALONG THE SOUTHERLY LINE OF SAID SECTION 4, S 89°00'56" W 1978.57 FEET; THENCE N 01°31'31" W 233.57 FEET TO A BRASS CAP MONUMENT STAMPED CORNER #3, BEING THE TRUE POINT OF BEGINNING OF THIS DESCRIPTION; THENCE N 01°31'31" W 100.00 FEET; THENCE N 88°21'39" E 169.98 FEET TO A POINT WHICH BEARS N 01°31'31" W FROM CORNER #2, A BRASS CAP MONUMENT; THENCE S 01°31'31" E 100.00 FEET TO SAID CORNER #2; THENCE S 88°21'39" W 169.98 FEET TO THE TRUE POINT OF BEGINNING.

Legal Description Tract C

ALL THAT REAL PROPERTY SITUATED IN SECTION 9, TOWNSHIP 20 NORTH, RANGE 19 EAST OF THE INDIAN BASE AND MERIDIAN, MAYES COUNTY, OKLAHOMA, DESCRIBED AS FOLLOWS: COMMENCING AT A 3/4" REBAR MARKING THE NORTHEAST CORNER OF SAID SECTION 9; THENCE ALONG THE NORTHERLY LINE OF SAID SECTION 9, S 89°00'56" W 1978.57 FEET; THENCE S 01°31'31" E 76.40 FEET; THENCE N 88°21'39" E 169.98 FEET TO A BRASS CAP MONUMENT STAMPED CORNER #5, BEING THE TRUE POINT OF BEGINNING OF THIS DESCRIPTION; THENCE N 88°21'39" E 280.00 FEET TO THE WESTERLY RIGHT-OF-WAY LINE OF 45TH STREET, A STREET 60 FEET IN WIDTH; THENCE ALONG SAID RIGHT-OF-WAY LINE S 01°31'31" E 591.69 FEET TO A POINT WHICH BEARS N 88°21'39" E FROM CORNER #6, A BRASS CAP MONUMENT; THENCE S 88°21'39" W 280.00 FEET TO SAID CORNER #6; THENCE N 01°31'31" W 591.69 FEET TO THE TRUE POINT OF BEGINNING.

Legend

ACC	ACCESS	MB	METER BOX
A/C	AIR CONDITIONER	MW	MONITORING WELL
BLDG	BUILDING	OE	OVERHEAD ELECTRIC
B/L	BUILDING SETBACK LINE	PIV	POST INDICATOR VALVE
COMP	CORROGATED METAL PIPE	PP	POWER POLE
CL	CENTERLINE	PVC	POLYVINYL CHLORIDE PIPE
CO	SEWER CLEAN-OUT	RCP	REINFORCED CONCRETE PIPE
CONC	CONCRETE	RR	RAILROAD
COR	CORNER	R/W	RIGHT-OF-WAY
DGD	DOUBLE GRATE DROP INLET	SD	STORM DRAIN
DS	DOWNSPOUT	SDMH	STORM DRAIN MANHOLE
EP	EDGE OF PAVING	SGDI	SINGLE GRATE DROP INLET
EPED	ELECTRIC PEDESTAL	SS	SANITARY SEWER
FF	FINISH FLOOR	SSMH	SANITARY SEWER MANHOLE
FH	FIRE HYDRANT	TC	TOP OF CURB
FL	FLOWLINE (INVERT)	TG	TOP OF INLET GRATE
FNC	FENCE	TH	TOP OF HEADWALL
FND	FOUND	TP	TOP OF PAVING
FP	FLAGPOLE	TPED	TELEPHONE PEDESTAL
G	GUTTER	TR	TOP OF MANHOLE RIM
GM	GAS METER	TYP	TYPICAL
GP	GUARD POST	WL	WATERLINE
GR	GAS RISER	WM	WATER METER
GUY	GUY DOWN	WV	WATER VALVE
ICV	IRRIGATION CONTROL VALVE	UG	UNDERGROUND GAS LINE
IP	IRON PIN	UE	UNDERGROUND ELECTRIC
LNA	LIMITS OF NO ACCESS	UT	UNDERGROUND TELEPHONE
LP	LIGHT POLE	XFMR	TRANSFORMER

1-STORY BUILDING WITH METAL SIDING UNLESS OTHERWISE NOTED

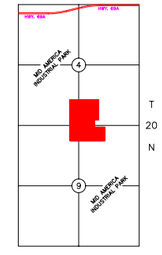
PLANT PROCESS AREA

CONCRETE

ASPHALT

GRAVEL

Scale: 0 30 60 120 240



Location Map
SCALE: 1"=2000'

Figure 4-2

Detailed Facility Plot Plan

Mayes County, Oklahoma

Mid America Industrial Park

Surveyor's Statement

WE, SISEMORE & HALL, INC. DO HEREBY STATE TO:

MAYES COUNTY ABSTRACT CO.
FIRST AMERICAN TITLE INSURANCE COMPANY
ELF ATOCHEM NORTH AMERICA, INC., A PENNSYLVANIA CORPORATION
NORTH AMERICAS, INC.

THAT: (i) THIS SURVEY IS TRUE AND ACCURATE,, WAS MADE ON-THE-GROUND AS PER THE FIELD NOTES SHOWN HEREON, ACCURATELY SHOWS THE BOUNDARY LINES AND DIMENSIONS OF LAND INDICATED HEREON, ACCURATELY SHOWS THE LOCATION OF ALL BUILDINGS AND STRUCTURES, AND ACCURATELY SHOWS THE LOCATION OF ALL IMPROVEMENTS SHOWN HEREON, ACCURATELY SHOWS THE LOCATION AND DIMENSION OF ALL EASEMENTS, RIGHTS-OF-WAY AND OTHER MATTERS OF RECORD BY WHICH THE UNDERSIGNED HAS BEEN ADVISED AFFECTING THE SUBJECT PROPERTY ACCORDING TO THE LEGAL DESCRIPTION OF SUCH EASEMENTS (WITH INSTRUMENT, BOOK AND PAGE NUMBER INDICATED). (ii) EXCEPT AS SHOWN, THERE ARE NO EASEMENTS OR RIGHTS-OF-WAY OF WHICH THE UNDERSIGNED HAS BEEN ADVISED AFFECTING THE SUBJECT PROPERTY, THERE ARE NO ENCROACHMENTS OR PROTRUSIONS ONTO ADJOINING PREMISES, STREETS OR ALLEYS BY ANY BUILDINGS OR VISIBLE IMPROVEMENTS ON THE SUBJECT PROPERTY, THERE ARE NO ENCROACHMENTS ON THE SUBJECT PROPERTY BY BUILDINGS OR VISIBLE IMPROVEMENTS SITUATED ON ADJOINING PREMISES, (iii) WE HAVE EXAMINED A MAP BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY, FLOOD INSURANCE RATE MAP, MAYES COUNTY, OKLAHOMA UNINCORPORATED AREA, COMMUNITY PANEL NO. 400458 0005 B, MAP REVISED: DECEMBER 1, 1989, WHICH SHOWS THE ENTIRE PORTION OF THE PROPERTY DESCRIBED HEREON AS LOCATED IN ZONE (C) WHICH IS CLASSIFIED AS AREAS OF MINIMAL FLOODING (i.e. OUTSIDE THE LIMITS OF THE 500-YEAR FLOOD). (iv) WE FURTHER STATE THAT THIS MAP OR PLAT OF SURVEY AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH "MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS," JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND ACSM IN 1992, AND INCLUDES ITEMS 1, 2, 3, 6, 10 AND 11 OF TABLE A THEREOF, AND PURSUANT TO THE ACCURACY STANDARDS (AS ADOPTED BY ALTA AND ACSM AND IN EFFECT ON THE DATE OF THIS STATEMENT) MEETS THE REQUIREMENTS OF AN URBAN SURVEY.

THIS PLAT OF SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS, AS ADOPTED BY THE BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS FOR THE STATE OF OKLAHOMA.

WITNESS MY HAND AND SEAL THIS 18TH DAY OF MARCH, 1996.

SISEMORE & HALL, INC.

BY: _____

ALAN C. HALL, EXECUTIVE VICE PRESIDENT
REGISTERED PROFESSIONAL LAND SURVEYOR
OKLAHOMA NO. 1283

ALAN C. HALL 1283 REGISTERED PROFESSIONAL LAND SURVEYOR OKLAHOMA

A00BGRNDC0011 – 07005043

REVISIONS	BY	DATE

Sisemore & Hall
11000 E. 51ST STREET, SUITE A
TULSA, OKLAHOMA 74146
C.A. NO. 2421
PHONE:(918)663-7700
FAX:(918)663-5500
EXP. DATE 6/30/97

FILE:	2019.0400	SURVEY BY: RWB	DATE: 3/18/96
ORDER:	11436	DRAWN BY: JSR	SCALE:
BOOK:	831/31	CHECKED BY: EDR	SHEET 1 OF 1

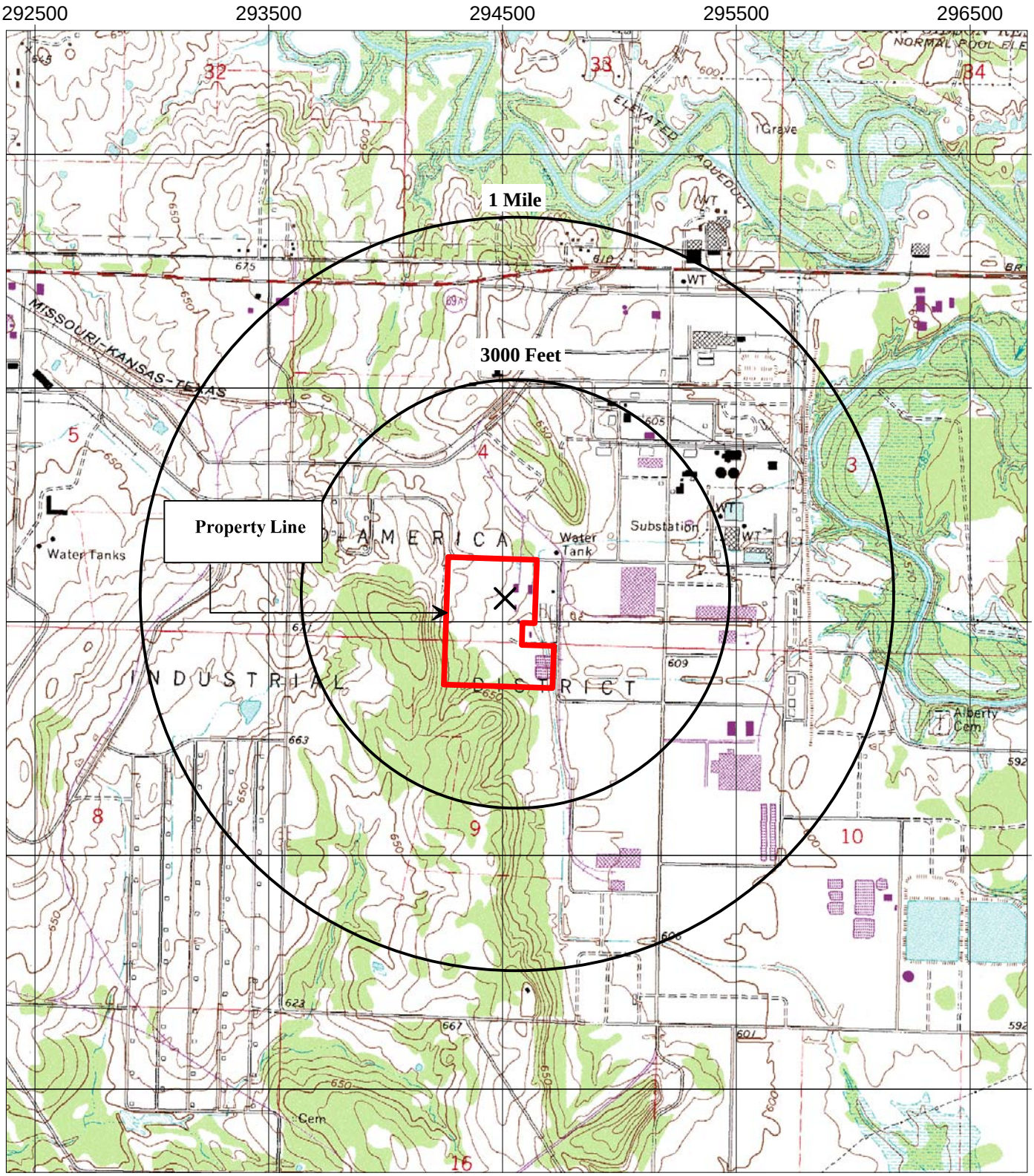
DRAWING: TX-MAYES

SECTION 5
AREA MAP

The Pryor Facility is located in Mayes County, Oklahoma. Mayes County is an attainment area for all criteria pollutants and is a Class II PSD area as defined by U.S. EPA.[13]

An area map showing the Pryor Facility property boundaries overlaid on the most recent United States Geological Survey (USGS) 7.5-minute series topographical maps of the area (1:24,000 scale) is shown in Figure 5-1. The area map shows predominant geographical features such as highways, roads, and streams, as well as significant landmarks such as buildings. The USGS 7.5-minute quadrangle maps used for this figure are Chouteau, Oklahoma (1982), and Pryor, Oklahoma (1970). This figure also includes Universal Transverse Mercator (UTM) coordinates in NAD83 along the horizontal and vertical axis, in meters.

[13] 40 CFR §52.21(e)(3)



SCALE (1:24000)

0 250 500 750 1000 meters

NORTH

USGS Map, NAD83
Chouteau (OK), 1:24000, 1982
Pryor (OK), 1:24000, 1970

FIGURE 5-1
Site Location Map
RT 3 Box 696
Pryor, OK 74361

SAGE
ENVIRONMENTAL CONSULTING

DATE: August 2010

PROJECT: 148-2-6

FILE NAME: Area Map.srf

SECTION 6
MODELING EMISSIONS INVENTORY

Pryor Facility and Sage Environmental evaluated and quantified current hourly emissions of NO_2 and SO_2 associated with all sources at Pryor Facility. It is not likely that all of the emissions would occur simultaneously; however, in our analyses all sources will be included in the modeling at the maximum rate.

An extensive correspondence exchange occurred between the ODEQ and NORIT in 2009 regarding the PTE for all SO_2, NO_2, and PM_{10} sources. The purpose of the correspondence exchange was to determine whether the Pryor Facility is subject to Class I Impact modeling. The data review revealed a discrepancy in the NO_2 maximum hourly emission rate for the primary carbonizer. The PTE for this source in the ODEQ files is 42.0 lbs/hr. The actual NO_2 PTE for this source documented by NORIT is 23.42 lbs/hr. This discrepancy was not discussed with ODEQ and the larger emission rate was used in the 2009-2010 Class I impact analyses; however, the more appropriate 23.42 lbs/hr emission rate will be used in the proposed modeling. NORIT has previously provided the documentation of this lower emission rate to ODEQ and will re-submit the documentation upon request.

On-site emission sources included in the modeling input files will be the same for all modeling steps discussed in Sections 2.3.1 and 2.3.2. The modeler proposes to ignore the emission rates prior to the completion of the 1988-1989 project and assume that the current potential emissions are all "new" emissions. The source selection is addressed in the following subsections, which provide a brief description of the modeling setup for the different types of emission sources and the source grouping. The steps numbers referred to in the text correspond to Section 2.3.1 discussion.

6.1 Modeling Steps 1 and 2 Sources

The Steps 1 and 2 analyses will be completed for on-site sources of NO_2 and SO_2. Modeling of emissions from all Pryor facility sources will be conducted to determine if the predicted concentrations plus the background monitored design concentration total exceeds 90% of the NAAQS.

A significant impact area (SIA) will not be defined as a result of modeling. Per the discussion in Sections 2 and 9, the modeled receptors will cover a circular region centered on the Pryor Facility sources with a radius extending either 20 km or 50 km for NO_2 and 50 km for SO_2.

For determination of the impact area, the U.S. EPA guidance[14] requires modeling of "contemporaneous emissions increases and decreases" (i.e., the difference between the post-project emissions and pre-project emissions). As stated above, the modeler proposes to treat all existing sources as new sources and assume that all pre-project emissions were zero.

Five individual emission sources existing at the Pryor Facility are expected to be included in the modeling files. All sources will be classified as point sources and will be included in the BEEST modeling setup files. Tables showing the source parameters specific for each model run will also be presented in the appendices of the modeling report. These tables will show UTM coordinates, emissions rates, and release parameters for each modeled pollutant and emission source. No by-pass scenarios will be modeled, as discussed below.

The source locations and parameters will be the same as those already used in the 2008 original and 2009 revised PSD modeling. The 2009 PSD and Class I impact modeling included two additional scenarios for full and partial bypass of the secondary carbonizer. In all cases, the results for the three modeling scenarios were very similar, with the scenario with no bypass showing slightly higher concentration than any scenario that included bypass in most cases. We request to include only the main no-bypass scenario in the NO_2 and SO_2 1-hour concentration evaluations.

Only one source group will be created for the Steps 1 and 2 modeling to represent the maximum off-property concentration or the concentration at the location of the monitoring station. The group ALL will include all emission sources described in this section.

U.S. EPA has not established a PSD Monitoring Significance Level for the new NO_2 and SO_2 1-hour standards or $PM_{2.5}$ standards. It is remotely possible that U.S. EPA will establish such levels in future. If a PSD Monitoring significance is established, then the Pryor Facility could be required to monitor ambient air concentrations in case the predictions exceed the threshold; however, NORIT and Sage believe that the facility should be exempted from post-construction monitoring because representative ambient monitoring data is available for all three pollutants. The existing monitoring data is discussed in Section 6.4 below. If needed, additional justification for use of the existing monitoring site nearby Pryor consistent with the U.S. EPA publication *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA-454/R-99-005) will be provided to the ODEQ when requested.

6.2 Modeling Steps 3 through 6 Sources

Refined modeling will be conducted if the Steps 1 and 2 results will exceed 90% of the NAAQS. All on-site sources that generate NO_2 and SO_2 emissions will be included in the modeling. The Pryor Facility sources will be modeled with parameters matching the parameters and emission rates used in the Steps 1 and 2 modeling.

[14] *New Source Review Workshop Manual. Prevention of Significant Deterioration and Nonattainment Area Permitting,* Section C.IV.B. U.S. EPA, Office of Air Quality Planning and Standards. October 1990.

The stack parameters and emission rates for the off-site emission sources of NO_2 and SO_2 were obtained from ODEQ Point Source Database (PSDB) Retrieval Section in 2008 during the preparation for Full Impact Modeling. The database included all NO_2 sources within 70 km and all SO_2 sources within 100 km from the Pryor Facility. ODEQ and other state agencies personnel screen out sources per the "10-D Rule." The lists of sources provided to NORIT thus included 83 NO_2 sources located at distances ranging from 796 meters to over 66 km from the facility and included 101 sources located at distances ranging from 868 meters to over 96 km from the facility. Of great importance is the fact that the maximum hourly emission rate was provided in the retrieval for each off-site source, which allows using the data in short-term modeling for NO_2 without additional adjustments.

Sage proposes to use the 2008 database retrievals in the current modeling. The PSDB information transferred to the model will include all sources regardless of their distance from the Pryor Facility. The relative location of the off-site emission sources included in the modeling run will be shown on the drawings included in the appendices of the modeling report.

The site is located approximately 85 km from the State of Kansas, 65 km from the State of Missouri, and 60 km from the State of Arkansas. Sage proposes that no PSDB retrievals should be requested from any of these three states for inclusion in the NO_2 modeling even if the receptors for NO_2 modeling will extend 50 km from the facility (see Sections 6.1 and 9).

6.3 PSD Increment Modeling

U.S. EPA has not established a PSD Increment for any of the pollutants and averaging periods disused in this protocol; therefore, no increment modeling is expected to be required.

6.4 Background Concentrations

EPA's GAQM discusses how background air quality data is combined with model-predicted "design" concentrations to determine the total ambient concentration. The total concentration is then compared to the NAAQS. Background air quality includes ambient concentrations that are caused by emissions from natural sources, nearby sources other than the sources included in the dispersion model, and any other unidentified background sources.

GAQM Section 8.2 discusses how background air quality concentration data should be derived. This guidance states that air quality data collected in the vicinity of the source, or at representative regional locations, is used to determine the background concentration at each monitor by excluding values when the source in question is impacting the monitor. The mean annual background is the average of the annual concentrations so determined at each monitor. For shorter averaging periods, the maximum concentrations for the modeled sources for each separate averaging time may be excluded to determine the average background value. Additional guidance on the use of background data has been provided by EPA in March 2010 for $PM_{2.5}$ NAAQS analyses, and in June 2010 for 1-hr NO_2 analyses.

Sage searched the available ambient air monitoring data for Pryor, OK. A review of the U.S. EPA AirData database[15] revealed an official EPA's SO_2, NO_2, PM_{10}, and ozone monitoring site in Mayes County, OK, which is considered representative for Pryor. The EPA's Site ID for the monitor is 400979014.

The NO_2 and SO_2 and PM_{10} monitoring data from the Mayes County monitor is available starting calendar year 2004. Shown on Table 6-1 is a summary of the monitoring data. Also shown on the this table are the monitoring design values provided by ODEQ in the modeling request letters referenced in Footnotes 8 and 9.

Table 6-1
Ambient Air Quality Monitoring Data for Mayes County, Oklahoma

Year	1st Max 1-hour NO_2 (ppb)	1st Max 1-hour NO_2 ($\mu g/m^3$)	1st Max 1-hour SO_2 (ppb)	1st Max 1-hour SO_2 ($\mu g/m^3$)
2004	28	52.8	37	96.7
2005	34	64.2	48	125.4
2006	34	64.2	43	112.4
2007	23	43.4	58	151.6
2008	23	43.4	52	135.9
2004-2008 Average	28.4	53.6	47.6	124.4
ODEQ Recommended		**43.0**		**151.9**
NAAQS	100	188.7	75	196.0
% of NAAQS	28.4%	22.8%	63.5%	77.5%

Notes:

The U.S. EPA's Ambient Air Quality Monitoring Station ID: 400979014 is located at Cherokee Heights Drive in Mayes County, Oklahoma.

Per the U.S. EPA discussion[16] of 1-hour standard for NO_2, "EPA … is setting a new "form" for the standard. … The form for the 1-hour NO_2 standard is the 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations." A comparison of the monitored values with the ODEQ recommended values clearly indicate that the recommended design monitored values are based on the results of the pollutants monitoring at the referenced monitoring station. Since the 98th percentile values are not readily available from the AirData database, Sage will use the ODEQ recommended values presented in Table 5-2 in Steps 1 through 4 modeling for both pollutants. However, we request an approval to use 5-year average or 98th percentile monitored values in Steps 5 and 6 modeling, if necessary to demonstrate compliance with the NAAQS.

In case the modeled concentrations plus the background concentration total exceeds the standard, the background concentration in Modeling Steps 2 through 4 will be adjusted as

[15] U.S. EPA. *AirData: Access to Air Pollution Data.* http://www.epa.gov/air/data/.
[16] U.S. EPA. *Fact Sheet: Final Revisions to the NAAQS for Nitrogen Dioxide.* http://www.regulations.gov.

follows. First, an additional model run will be completed to predict the H1H 1-hour concentration at the location of the monitor. In Steps 5 and 6, the 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations at the location of the monitor may be used instead. Second, the predicted value will be subtracted from the monitored value. Third, the difference will be used as the "true" background concentration value for a comparison of the model-predicted concentrations for specific receptors with the NAAQS.

SECTION 7
LAND USE AND TERRAIN

The land use within a 3-kilometer (km) radius of the CRRM facility was evaluated using current USGS 7.5-minute quadrangle maps and general knowledge of the area. Rural land use clearly prevails in the area; therefore, the AERMOD-default rural dispersion option will be used in all air quality analyses.

The complex terrain option will be used in the modeling to account for the elevation of the off-site sources and accurately predict the impacts. Base elevations of the facility emission sources, buildings, and all receptors will be obtained from the Digital Elevation Models (DEM) files. Each DEM dataset consists of a sampled array of elevations for ground positions that are normally spaced at regular intervals. Each of the DEMs used in the modeling setup provides coverage in 7.5- by 7.5-minute blocks. 7.5-minute DEM's are also referred to as "30-meter" (because of 30-meter data spacing) or "1:24,000 scale" DEM data.

Level 2 7.5-minute Quad (Quadrangle) DEMs covering a 50-km distance in each direction from the center of the facility were obtained for 2008 and 2009 modeling. These DEM files data coordinates were all converted to NAD83. Sage proposes to use the same files in the new modeling. Copies of the files will be included with the modeling report on a CD. Beyond the 50-km radius, 1-degree DEMs were used in 2008 modeling to evaluate elevations for off-site sources. These DEMs are also referred as “100-meter” (because of 100 meter data spacing) or 1:250,000 scale DEM data. Sage proposes to use the same files in the new modeling.

The terrain elevations will be imported into the AERMOD input file using the BEEST for Windows built-in sub-routine that utilizes the latest EPA’s AERMAP (version 06341) software. The elevations will be calculated for each model object using the built-in functions of the BEEST for Windows Suite modeling package and utilizing the linear interpolation option, which will allow AERMAP to properly estimate the hill height elevations and terrain slopes.

In 2008 modeling, terrain elevations and hill heights could not be calculated for a limited number of receptors located between the boundaries of the DEM files. In his review of the October 2007 pre-modeling protocol, Mr. Eric Milligan of the ODEQ approved removal of receptors that are beyond the edge of some of the DEM files (e-mail time-stamped October 26, 2007 7:39 AM). The specified receptors will not be used in the proposed modeling.

SECTION 8
BUILDING WAKE EFFECTS (DOWNWASH)

Direction-specific building dimensions and the dominant downwash structure parameters used as input to the AERMOD model will be determined using GEP/BPIPPRM (Good Engineering Practice/Building Profile Input Program for PRIME) program, a built-in part of the BEEST for Windows Suite package used in the modeling. This software incorporates the most recent algorithms of the U.S. EPA approved BPIPPRM, version 04274. BPIP is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document, the Building Downwash Guidance document, and other related documents.

Data input for each structure at the Pryor facility will be used by the BPIPPRM program to calculate the direction-specific downwash parameters. The BPIPPRM program generates the height and width downwash parameters for thirty-six compass directions for each structure with reference to each point source of emissions. BPIPPRM also takes into account the difference in the base elevation of the point source and the structure to determine the good engineering practice (GEP) stack height or the height at which the stack will not be affected by downwash from the structure.

The output from the BPIP contains a summary of the dominant structures for each emission unit (considering all wind directions) and the actual building heights, projected widths, and three additional parameters for 36 wind directions. This information will then be incorporated into the data files for the AERMOD model using the BEEST for Windows Suite's built-in functions. The BPIP input and output files will be included with the modeling report on a CD.

SECTION 9
RECEPTOR GRIDS

Sage proposes to use the receptor grids from the 2008 PSD FIM files without any modifications for SO_2 model runs. For NO_2, either the 20-km radius grid from the 2008 PSD FIM will be used, or the grid will be replaced with the 50-km radius grid from the SO_2 model runs, as guided by ODEQ per the discussion below and in Section 2.3.1, Modeling Step 1.

The final grid design was suggested by Mr. Eric Milligan of the ODEQ during the discussion of the pre-modeling protocol prepared for the original 2008 PSD modeling (several e-mail messages dated October 2007). More specifically, Mr. Milligan provided the following recommendations:

> *The modeling grid does not have to extend out to 50 km. The grid should be big enough to pick up the maximum impacts from the sources being modeled. Pryor is actually located in a river plain that is surrounded on both sides by hills. Maximum impacts can occur on calm days as the plumes encounter hills at or near the same height as the stacks. I took at the terrain around the facility and if you were to extend your grid out to 20 km on each side you would pick up all the peaks on the hills to the east and west.*

Based on the discussion above and to avoid Preliminary Impact Modeling, Sage proposes to limit the maximum radius within which receptors will be places for NO_2 modeling to 20 kilometers.

All receptor coordinates will have a datum of NAD83. The receptor elevations for all grids will be evaluated using the BEEST for Windows software's built-in sub-routine that utilizes the AERMAP program, which will process the DEM files covering the areas of concern. An interpolation method will be utilized for the elevation calculations.

9.1 Modeling Steps 1 through 4 Receptors

Once the ROI is approved for each pollutant, refined grids from the 2008 FIM will be used in Steps 1 through 4 to estimate the appropriate concentrations for each applicable pollutant and averaging period. Ground-level concentrations will be predicted using receptor grids with different receptor spacing consistent with Section 2.3.7 of the ODEQ's AQMG, December 2006 edition. The "property line grid" will be a discrete receptor grid with the receptors spaced at 100-meter intervals along the property line. The fine grid will have the receptors spaced 100 meters apart and extending at least 1,000 meters from the property line. Receptors spaced 250 meters apart will cover areas extending at least 2.5 km from the property line; receptors spaced 500 meters apart will cover areas extending at least 5 km from the property line; and receptors spaced 1,000 meters apart will cover areas extending up

to the maximum distance. The receptors at the corners of the outer square will be removed such that the outer receptors will form a circular area.

9.2 Modeling Steps 5 and 6 Receptors

The logic behind the proposed reduction in the number of receptors used in refined modeling which predicts 98th percentile values is discussed in section 2.3.1 for Step 5 modeling. If the areas where a Step 4 modeling predicts exceedances of 1-hour NAAQS for either or both pollutants will occur in the area with receptors are spaced 500 or 1,000 meters apart, additional receptors spaced 250 meters apart will be added between and around the receptors with predicted exceedances. These additional receptors will extend at least 500 meters from the outer receptors in the area for which the exceedance is predicted. This proposed receptor setting will ensure that no concentrations exceeding the NAAQS are lost in any refined modeling.

SECTION 10
METEOROLOGICAL DATA

The AERMOD model runs will be conducted using five years (2001-2005) of meteorological data (SFC and PLF files) that are based on surface data from the Tulsa International Airport (NWS Station No. 13968), upper air data from the Springfield, Missouri station (NWS Station No. 13995), and mesonet data used as onsite data. All files updated in the middle of year 2009 were provided by Mr. Eric Milligan of the Oklahoma DEQ to Sage on October 6, 2009.

Separate runs will be conducted for each of the five years modeled. The profile base elevation for the Tulsa International Airport station (Station No. 13968) of 198.1 meters above sea level will be used in the setup. Copies of the files will be included on a CD accompanying the report.

SECTION 11
MODELING OPTIONS AND POST-PROCESSING

While the new 1-hour NAAQS is defined relative to ambient concentrations of NO_2, the majority of nitrogen oxides (NO_X) emissions for stationary and mobile sources are in the form of nitric oxide (NO) rather than NO_2. In addition, the new standard is attained when the 3-year average of the 98th-percentile of the annual distribution of daily maximum 1-hour concentrations does not exceed the threshold value of 100 parts-per-billion. As a result, special techniques discussed below will be used to demonstrate compliance of the Pryor Facility operations with the new standard.

11.1 NO_2 Modeling Options

The U.S. EPA's NO_2 modeling memorandum[17] provides four main options for 1-hour averaging period modeling for NO_2:

- Tier 1 – Regulatory default modeling assuming full conversion of NO to NO_2;
- Tier 2 (Ambient Ratio Method, aka ARM) – Regulatory default modeling with Tier I results multiplied by empirically-derived NO_2/NO_X annual national default ratio of 0.75;
- Tier 3A (Ozone Limiting Method, aka OLM) – non regulatory default beta option;
- Tier 3B (Plume Volumetric Molar Ratio Method, aka RVMRM) – non regulatory default beta option.

Tier 2 option will be used in the modeling. The emission rate for each modeled source was adjusted using a 0.75 scalar using a SEASON emission rate flag in the source options.

11.2 Post-processing of the Modeling Results in Steps 5 and 6 Modeling

Since AERMOD (version 09292) does not directly calculate 1-hour NO_2 and SO_2 NAAQS design concentrations according to the latest EPA guidance, Bee-Line Software's NO2POST and SO2POST post-processors will be used to process the H1H modeling concentrations, calculate the appropriate percentile values, average them over the specified number of years. The design value calculated by the post-processor is the highest of the 98th percentile values for NO_2 and 99th percentile values for SO_2 of the maximum daily one-hour concentrations, averaged over the number of years modeled (five years for 1-hour NAAQS modeling analyses, consistent with the U.S. EPA guidances).

To generate the necessary input files for NO2POST and SO2POST, AERMOD will be run with the POSTFILE output option. The post files generated by the model contain every

[17] U.S. EPA, *Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 NAAQS*, Memorandum, Office of Air Quality Planning and Standards, June 28, 2010.

modeled 1-hour concentration at every receptor for each year modeled. For each modeled year, NO2POST or SO2POST subroutine selects the highest 1-hour concentration at each receptor and each day, calculates the 98th/99th percentile value at each receptor, and then averages the 98th/99th percentile values at each receptor over the modeled number of years. Both processors provide a plot file for plotting the average 98th/99th percentile values at each receptor, and displaying the maximum of the average 98th/99th percentile values over the entire receptor grid, in units of both micrograms per cubic meter and parts per billion, for comparison to the NAAQS.

11.3 Units Conversion

AERMOD output concentrations are in micrograms per cubic meter of air ($\mu g/m^3$). The standards are expressed in parts per billion parts of air (ppb). After post-processing of the results and finding the 3-year average of the 98th/99th percentile of the annual distribution of daily maximum 1-hour concentrations in $\mu g/m^3$, the predicted value in ppb will be found from the plot files discussed in Section 11.2 or will be converted to ppb using a factor based on standard atmospheric conditions. The conversion factors are:

For NO_2:

- 1 ppb = 1.8868 $\mu g/m^3$, and
- 1 $\mu g/m^3$ = 0.53 ppb.

For SO_2:

- 1 ppb = 2.613 $\mu g/m^3$, and
- 1 $\mu g/m^3$ = 0.3827 ppb.

SECTION 12
MODELING RESULTS AND SUBMITTALS

The modeling results will be summarized in a modeling report to be submitted to the Oklahoma DEQ. This report will include a textual description of all phases of the modeling analysis and tables comparing the maximum predicted concentrations for each averaging period for each pollutant to the applicable NAAQS.

The report will also include figures showing isopleths (lines of constant concentration) of the predicted concentration of each pollutant over the receptor grid area. Each figure will also show the location of the highest predicted concentration, as appropriate.

The report will also include a CD containing all files pertinent to the modeling analyses in electronic format. This CD will contain all input and output files for AERMOD used to generate the results presented in the report. The meteorological, DEM, BPIP, and supporting information files will also be included in the CD. Only electronic copies of the modeling input and output files and files generated by the modeling software (like BPIPPRM files) will be submitted with the modeling report. Paper copies of the computer output files may be printed out from the *.LST files. Such paper copies may be submitted to the ODEQ and the EPA upon additional request.